

NASA SBIR/STTR Technologies

S3.04-8539 - Ionic Liquid, Nontoxic Monopropellants for Power-Limited Spacecraft



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Identification and Significance of Innovation

- * The Science Mission Directorate requires propulsion for precision landing, hazard avoidance, in-space rendezvous, longer-ranging surface mobility, and ascent/descent vehicle propulsion
- * We propose the study and development of advanced ionic liquid, non-toxic monopropellants featuring an innovative combination of anions and cations that will enable high duty cycle, extended operation of power-limited spacecraft
- * The proposed ionic liquid, non-toxic monopropellant propulsion technology will lead to:
 - * Reduced costs in the system components and ground servicing
 - * Enable prolonged mission or systems lifetimes
 - * Improved reliability
 - * Enhanced critical mission functions



Estimated TRL at beginning and end of contract: (Begin: 2 End: 4)

Technical Objectives and Work Plan

Technical Objectives:

- * Extend work done on HEH-nitrate as non-toxic monopropellants
- * Test different, non-stoichiometric anion/cation combinations to optimize the energetic ionic liquid
- * Conduct studies of the catalyst bed to identify the optimal distribution and modality

Work Plan:

- * Refurbish and update IL monopropellant thruster
- * Test thruster with alkyl chain group ionic liquids
- * Test different anion/cation combinations
- * Catalyst bed mesh studies

NASA Applications

- * Non-toxic, monopropellant system for power-limited spacecraft
- * Ensure mission pull by teaming with Aerojet
- * Non-toxic monopropellant system technology can play an enabling role in future NASA SMD programs
- * Versatile multi-mission capabilities will make it applicable for a broad range of missions

Non-NASA Applications

- * Use on military platforms such as Kinetic Kill Vehicles (KKVs)
- * Adaptation for commercial satellites using hypergolic propellants for orbital maneuvering and station keeping

Firm Contacts

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NON-PROPRIETARY DATA